Approach : Acid base Equilibrium

As the topic is very close to the real life, a practical oriented approach and group discussion method is used to teach the chapter. Acid bases are most common topic among young children as it's a part of daily life.

Significant Concepts:

The terms acid and bases are relative. The perspective makes a huge change in its definition and how it reacts to a new substance, in a given situation also varies with changing definitions.

Guiding Questions :

What can be called as acid or base. How they behave in various given environment, their threats and blessing.

Central idea/Content:

8.1 Theories of acids and bases
8.2 Properties of acids and bases
8.3 Strong and weak acids and bases
8.4 The pH scale

18.1 Calculations involving acids and bases
18.2 Buffer solutions
18.3 Salt hydrolysis
18.4 Acid–base titrations
18.5 Indicators

Learning Objective:

Every day in life we face acids and base, in different medium and different context, some are helpful some are not, but a knowledge of each, acid and base and how they work, and how to work with them makes lives easier and comforting. More over nature is neither very acidic or basic, it balances between the both, and it's a vital lesson for natural way of living.

Info literacy & ICT

1. Virtual simulation of buffer to understand the buffer action is used
2. Virtual simulations of various types of acids and bases using various indictors are done with data-logging software and graphs are plotted and role of indicator, buffer region analyzed

International mindedness :

There are various ways acidity of basicity of a solution is measure in various parts of the world, but pH scale has made the understanding of acidity easier to non-chemists

TOK :

The distinction between artificial and natural scales could be discussed in the context of pH scale

Strategies/Activities/Differentiations :

This topic is taught with lots of hands on activity and virtual activity. Every lesson is backed up by on the class work which enforced learning. The students who has problem in understanding the basic chemistry behind it were given easier problems for confidence building and then moved to normal main stream set of works

Resources :

1. IB chemistry-Geoff Neuss
2. Chemistry text book-Catrin Brown
3. IB revision guide-Geoff Neuss
4. PowerPoint presentations as teaching aid (on core and advanced concepts)
5. Web resources (teacher tube etc)
6. IB-Question bank on Acid base equilibrium
7. Worksheet on
    a. Conjugate acid base pair
    b. Lewis acid base identification
    c. Acid base properties
    d. Acid base reactions

Unit reflections:

Approach : Redox Equilibrium
Interactive

Significant questions:
Oxidation is loss and reduction is gain of electrons, or in terms of oxidation number oxidation is increment but reduction is decrement.

Guiding Questions :
Can oxidation and reduction happen together, if yes, what are the indicators of that?
Where can I apply my knowledge of oxidation and reduction in regular life.

Central idea/Content:
9.1 Introduction to oxidation and reduction
9.2 Redox equations
9.3 Reactivity
9.4 Voltaic cells
9.5 Electrolytic cells
19.1 Standard electrode potentials
19.2 Electrolysis

Learning Objective:
Students learnt oxidation and reduction in terms of electron loss or gain or in terms of increase or decrease in oxidation number. Practical application of oxidation and reduction in storage batteries, and electroplating, or purification or extraction of metals is explained with reference to reactivity series, which sometimes dictates the feasibility of a given reaction.

Info literacy & ICT:
1. Virtual simulation of the electrolysis of copper (II) sulphate is discussed.

International mindedness:
Oxidation number is an universal term, which replaces the older definitions like valance, etc.

TOK :
2. Are oxidation numbers "real" ?
3. Chemistry has developed a systematic language that has resulted in older names becoming obsolete. What has been gained and lost in this process?

Strategies/Activities/differentiations :
This topic is taught with lots of hands on activity and virtual activity. Every lesson is backed up by on the class work which enforced learning. The students who has problem in understanding the basic chemistry behind it were given easier problems for confidence building and then moved to normal main stream set of works

Resources :
1. IB chemistry-Geoff Neuss
2. Chemistry text book-Catrin Brown
3. PowerPoint presentations as teaching aid (on core and advanced concepts)
4. Web resources (teacher tube etc)
5. Worksheet on
    a. Ionic equations
    b. Oxidation number
    c. Half equations
    d. Oxidizing and reducing agents
    e. Reactivity series

Unit reflections:

Approach : Organic Chemistry

Significant questions:
Which general group a particular compound belongs and what is the chemical property of the group?

Guiding Questions :
Organic chemicals behave similarly inside its homologous series. So it's important to understand which particular homologous series a compound falls under and how does it react to a particular group of reagents to form product?

Central idea/Content:

10.1 Introduction
10.2 Alkanes
10.3 Alkenes
10.4 Alcohols
10.5 Halogenoalkanes
10.6 Reaction pathways

20.1 Introduction 1
20.2 Nucleophilic substitution reactions
20.3 Elimination reactions
20.4 Condensation reactions
20.5 Reaction pathways
20.6 Stereoisomerism

Learning Objective:

This is an introductory course to organic chemistry. Students are expected to understand the whole range of organic chemicals is grouped into several categories called homologous series and all the members of the group behave similarly chemically. So it's more general reaction trends which apply to the group. In this course student will learn how the organic chemicals are named depending on the branching of carbon chain.

Info literacy & ICT:

Power point slide for anchoring thru the subtopics and concepts are used for better and clear understanding.

Flash animations are used for clear understanding of some reactions.
During this course, student will do several virtual experiments and simulations to understand the electrophilic and nuclophilic reactions and substitution or elimination or addition subtype.

International mindedness:

Why the IUPAC naming for organic compounds were introduced though most of the compounds are known for centuries.

TOK :

1. The use of the different formulas illustrates the value of different models with different depths of detail. This could be discussed as an example of the
2. Use of the language of chemistry as a tool to classify and distinguish between different structures.
3. The existence of optical isomers provided indirect evidence of a tetrahedrally bonded carbon atom. This is an example of the power of reasoning in allowing us access to the molecular scale. Do we know or believe those carbon atoms are tetrahedrally coordinated? The use of conventions in representing three- dimensional molecules in two dimensions could also be discussed.

Strategies/Activities/differentiations:

Students will be introduced with the initial concepts of the particular subtopic and they face an online test which poses some of the problems on the particular concept under consideration. Thereafter the more complicated concepts will be introduced in the next half of the class. Students were asked to read thru a particular part of text before next class.

Resources :

- IB chemistry-Geoff Neuss
- Chemistry text book-Catrin Brown
- PowerPoint presentations as teaching aid (on core and advanced concepts)
- Web resources (teacher tube etc)
- Worksheet on
    - Nomenclature
    - Isomerism
    - Reactions of alkanes
    - Reactions of haloalkane
    - Reactions of alkene
    - Reactions of alcohols

Unit reflections:

Approach : Option-A: Analytical Chemistry

This course provides us a brief outline of the analytical science which determines various chemical structure, detects criminals and other helpful application related to human health like MRI scan. (interactive classroom based, lecture based teaching)

Significant Concepts:

Determination of the exact structure of a particular compound is necessary for various drug design and vaccine invention.

Guiding Questions :

How to determine the structure of a given compound found in nature for industrial synthesis of it or chemical property analysis by the researchers.

Central idea/Content:

- A1 Analytical techniques
- A2 Principles of spectroscopy
- A3 Infrared (IR) spectroscopy
- A4 Mass spectrometry
- A5 Nuclear magnetic resonance (NMR) spectroscopy
- A6 Atomic absorption (AA) spectroscopy
- A7 Chromatography

Advanced topics

- A8 Visible and ultraviolet (UV-Vis) spectroscopy
- A9 Nuclear magnetic resonance (NMR) spectroscopy
- A10 Chromatography

Learning Objective:

Analaysis of chemical compounds are essential in terms of new drug design and testing of the old drugs and its effect on human health. But the modern processes has changed the we used to analyze or determine the structure of the compound previously. Basically during this course we will be concentrating on NMR, UV-visible and Mass spectra, all or any three and try to analyze them to determine the structure

Info literacy & ICT

As analytical chemistry is mostly data dependent, simulations available online on mass and NMR generation will be used for showing and predicting structure

International mindedness :

Is the present international patent law is supportive towards the low cost medicine and better human health?

TOK :

The electromagnetic spectrum is a carrier of information. The nature of the information is limited by its wavelength.

Strategies/Activities/Differentiations :

Students will be provided with the information and basic analytical technique using NMR, mass and UV-IR spectra. We will take a few known cases to understand information Given by these techniques and then try to analyze unknown information to determine the structure.
Activities includes Java applet for NMR spectra interactive
Students with ESL background will be provided with a vocabulary and definition list to understand the key terms clearly.

Resources :

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- IB revision guide-Geoff Neuss
- PowerPoint presentations as teaching aid (on core and advanced concepts)
- Web resources (teacher tube etc)
- IB-Question bank on Acid base equilibrium
- Worksheet on
    - Conjugate acid base pair
    - Lewis acid base identification
    - Acid base properties
    - Acid base reactions

Unit reflections:

Approach : Option-C: Industrial Chemistry

.In this course, a brief introduction to various chemical processes and their economy and other aspect (related to environment and human health) are discussed thru a chemical looking glass.

Significant Concepts:

Industry and economy are interrelated. understanding of the chemistry behind most industrial process, which may otherwise pose problems and create serious concern in the field of environment and biodiversity

Guiding Questions :

Is the industrial growth and economic development more important than human health and biodiversity? And if so how to balance between the both ends?

Central idea/Content:

C1 Iron, steel and aluminium 3.5
C2 The oil industry 2
C3 Addition polymers 2
C4 Catalysts 1.5
C5 Fuel cells and rechargeable batteries 2
C6 Liquid crystals 2
C7 Nanotechnology 2

Advanced topics

C8 Condensation polymers 1
C9 Mechanisms in the organic chemicals industry 1
C10 Silicon and photovoltaic cells 1
C11 Liquid crystals 2
C12 The chlor-alkali industry 2

Learning Objective:

At this age of industrial development and booming economy, its becomes essential for every chemistry student the various chemical processes which are the backbone of the chemical industries. It has its direct relationship in terms of economy, human health and safety and environmental issues. During this course we will be analyzing various important chemical process in the industry, what goes on in terms of chemical transformation and various factors related to human health and economic profitability.

Info literacy & ICT

International mindedness :

TOK :

- Who should decide whether particular directions in research are pursued? Who should determine priorities in the funding of research?
- The use of the scanning tunneling microscope has allowed us to “see” individual atoms. Does technology blur the distinction between simulation and reality?

Strategies/Activities/Differentiations :

Resources :

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- Chemistry text book-Catrin Brown
- IB revision guide-Geoff Neuss
- PowerPoint presentations as teaching aid (on core and advanced concepts)
- Web resources (teacher tube etc)
- IB-Question bank on Acid base equilibrium
- Worksheet on
    - Conjugate acid base pair
    - Lewis acid base identification
    - Acid base properties
    - Acid base reactions

Unit reflections:

<table>
<tr><td colspan="2">Approach : Option-F: Further Organic</td><td colspan="2">Significant Concepts:</td></tr>
<tr><td colspan="4">Guiding Questions :</td></tr>
<tr><td colspan="2">Central idea/Content:
• G1 Electrophilic addition reactions 3
• G2 Nucleophilic addition reactions 2
• G3 Elimination reactions 1
• G4 Addition-elimination reactions 1
• G5 Arenes 2.5
• G6 Organometallic chemistry 2.5
• G7 Reaction pathways 1
• G8 Acid-base reactions 2

Advanced topics 7 hours
• G9 Addition-elimination reactions 2
• G10 Electrophilic substitution reactions 4
• G11 Reaction pathways 1</td><td colspan="2">Learning Objective:</td></tr>
<tr><td>Info literacy & ICT</td><td>International mindedness :</td><td colspan="2">TOK :
For physical evidence, include a comparison of carbon-carbon bond lengths in alkanes, alkenes and benzene, and the number of structural isomers with the formula $C_6H_4X_2$. For chemical evidence, include a comparison of the enthalpies of hydrogenation of benzene, cyclohexene, 1,3-cyclohexadiene and 1,3,5-cyclohexatriene, and the tendency of benzene to undergo substitution rather than addition reactions</td></tr>
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